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the making of 'coves,' as may be perceived by the following considerations. The backward-cutting of a lateral stream can form a water-gap only where the longitudinal valley into which the lateral stream flows is decidedly lower than the longitudinal valley on the other side of the dividing-ridge; for, if there is no such difference of level, the pass through the ridge between the two will be eroded more and more slowly as it is lowered, and finally it will remain at practically a constant altitude above the valleys on either side. It can never form a drainage channel joining them: but, if the longitudinal valleys are of different heights, the result as described by Löwl may be produced; or, if a broad plateau-fold is bordered by a deep valley, its lateral streams may finally head up in coves or circular valleys, like those south of the west branch of the Susquehanna, and at many other points in the Appalachians. The geological map of Pennsylvania (1858) shows these admirably.

Now it may be asked, Are not the upper valleys of the Susquehanna, and of the other rivers that break through the Blue mountain, merely large examples of 'coves'? There are two objections to this explanation. First, what became of the head waters of these rivers before they had a south-easterly outlet? It seems most probable, that the many pre-existent streams in each river-basin concentrated their waters in a single channel of overflow, and that this one channel survives,—a fine example of natural selection. Second, how does it happen—notably in the case of the Susquehanna just above Harrisburg—that several deep water-gaps have been formed one behind the other? Such an arrangement might naturally result if the valley were antecedent; but it is difficult to account for if the several gaps result from the backward erosion of accidental lateral streams.

Löwl thinks that faults are greater obstacles to rivers than folds. He says, that even if river erosion could, under certain favorable conditions, keep pace with mountain folding, it does not follow that it could control a fault: for that would imply that the fault was formed gradually, and that its throw increased at a constant though imperceptible rate; and this he considers entirely unwarranted (408). It is certainly a difficult matter to understand the mechanics of such faults; and yet our ideas concerning them must conform to the facts as they occur in nature. In spite, therefore, of a natural preference for an active growth of faults, we are compelled, when we see streams running across them from the downthrow to the

upthrow side, to accord them a slow growth. Tennessee shows many examples of this paradoxical nature; and some of the faults thus disregarded, or, we might say, corrected, have a throw of several thousand feet. On the other hand, it cannot be denied that many faults have had a controlling influence on stream-courses; and we must therefore admit here, as above, the possibility of valley-cutting being stronger or weaker than orographic movements. The variety that is to be seen in the physical features of the earth, and that is consequently to be looked for in the conditions which determined them, is so great that it demands almost equal variety in the theories for their explanation.

W. M. DAVIS.

Cambridge, Jan. 12, 1883.

THE ORIGIN, AFTER BIRTH, OF ASPIRATION OF THE THORAX.

THE negative pressure in the pleural cavities, which plays such an important part in the respiratory mechanism of the adult mammal, and also exerts a marked influence upon the flow of blood and lymph, is known not to exist in unborn or stillborn mammals which have never breathed. It has hitherto been assumed, however, that it was established with the first inspiration; and all theories as to its mode of production have been controlled by this belief. Hermann, in an interesting paper (*Pflüg. archiv*, xxx. 276), shows that this assumption is incorrect. In infants which have lived and breathed after birth for periods of from one hour to eight days, there is found on experiment to be no negative pressure in the pleural cavity when the chest-walls are in their death position. This fact leads, necessarily, to important results in regard to the respiration of young mammals. Their lungs in expiration can contain hardly any of what in the adult is known as 'residual' air: they contain still some air imprisoned in the air-cells, and causing them to float in water. But this 'minimal' air is practically no more than what remains in a piece of adult lung squeezed between thumb and finger. Except this minute quantity, there is in the new-born mammal no stationary air. At each inspiration, air direct from outside enters the alveoli of the lungs; and, at each expiration, air from the alveoli is expelled, leaving the lungs practically empty. Hence the renewal of the air in the lungs is much more efficient than in adults. The high percentage of oxygen which the alveolar air must contain is probably correlated with the more active oxidations known to occur in the young animal. The question naturally arises, What is the object of the residual air in the lungs, and the negative pressure in the thorax, which we find established later? Hermann suggests three possible objects: 1°. Aspiration on the veins, promoting bloodflow to the heart; 2°. More uniform composition of air in the alveoli [and, we may add, more uniform temperature]; 3°. The presence of a certain store of air in the lungs in the case of a temporary stoppage of the breathing-movements. It remains to be seen at what age and rate the negative pressure in the thorax is developed. It is obviously brought about by a more rapid growth of the thorax than of the lungs.

H. NEWELL MARTIN.